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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,898	10/01/2004	Hiroto Ohtake	Q83944	2975

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EXAMINER	
HO, HOANG QUAN TRAN	
ART UNIT	**PAPER NUMBER**
2818	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/509,898	OHTAKE ET AL.	
	Examiner	Art Unit	
	Hoang-Quan Ho	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *5-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's amendment dated October 23, 2007 is acknowledged. Currently, claims 1 – 20 are pending in light of the amendment, in which claim 1 was amended, no claim was cancelled, claims 5 – 18 were withdrawn, and no claim was added have been entered of record.

Response to Arguments

Applicant's arguments filed October 23, 2007 are acknowledged and is responded as follows.

Applicant's arguments, see pgs. 7 – 9, with respect to claim 1 have been fully considered but they are not persuasive in view of the following reasons. Applicant may have misconstrued the cited disclosure and figures associated therewith. Kanegae teaches at par. 0163 – 166 with figs. 5(a) – 7 showing with clear indication that there are nitrogen and carbon concentrations in the organic/inorganic hybrid film. For instance, but not limited to, fig. 7 visibly shows that the organic/inorganic hybrid film still contains carbon and nitrogen concentrations, represented by C1s and N1s respectively, are present in the hybrid film, albeit in less amount than fig. 6(a). Fig. 7 is after the plasma etching process of fig. 6(a) according to par. 0166.

Applicant's arguments, see pg. 9, with respect to claim 2 have been fully considered but they are not persuasive in view of the following reasons. Applicant

submitted that the hybrid film 104 (or 104b) does not contain fluorine. The Examiner respectfully disagrees.

As disclosed in par. 0166, Kanegae teaches about the reformed composition close to SiO_2 film. Correlating the reformed portion with par. 0163 indicates that Kanegae is referring to ref. no. 104b. As indicated in par. 0163, 104b is the reformed layer. Furthermore, as aforementioned, fig. 7 is after the plasma etching process of fig. 6(a) according to par. 0166.

It is inherent, if not obvious to one of ordinary skill in the art to recognize that some fluorine concentration would be present in the hybrid film in absent of representation in fig. 7 of Kanegae for instance, because of the etching chemical used for creating the hole in the layer. Kanegae discloses that an etching chemical, such as C_4F_8 is used. See par. 0162, 0168 and 0183, but not limited thereto. Therefore, fluorine is embedded into the hybrid film when etched. Prior art's disclosure is similar to that of Applicant's claimed invention. See for instance, instant application's specification in U.S. Pat. App. Pub. No. 2005/0253272 A1, par. 0089 discloses that the use of C_4F_8 etching chemical is used and therefore causes fluorine to be embedded into the organic layer when etched. In view of the similarities of the process used to create a damascene in a device, it is found to be inherent, if not obvious.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 – 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanegae et al. (U.S. Patent App. Pub. No. 2002/0061654 A1), hereinafter as Kanegae.

Regarding claim 1, fig. 3 of Kanegae teaches a semiconductor device comprising:

an organic insulating film (ref. no. 104) having an opening (ref. no. 104a),

wherein said organic insulating film has an insulated modified portion (vicinity of ref. no. 104b, such as ref. no. 104b and/or the sidewalls of ref. no. 104a; also see figs. 21(a) – 21(c), ref. no. 710, par. 0305; ref. no. 710 is equivalent of ref. no. 104b, therefore will be considered equal and only reference to ref. no. 104b will be made hereinafter, however ref. no. 710 is still applicable) in a side of said opening (as seen in fig. 3), and,

said modified portions includes nitrogen atoms and carbon atoms (par. 0163 – 0166; also see figs. 5(a) – 7; as explained in Response to Arguments section).

Regarding claim 2, Kanegae teaches the semiconductor device according to claim 1, Kanegae teaches wherein said modified portion further comprises fluorine

atoms (par. 0064 – 0065 and 0068 – 0070; as explained in Response to Arguments section), and

a concentration of said fluorine atoms in said modified portion is lower than a concentration of said nitrogen atoms (see par. 0097 wherein nitrogen is used more for etching, therefore, nitrogen would be more than fluorine).

Regarding claim 3, Kanegae teaches the semiconductor device according to claim 2, Kanegae teaches further comprising:

a metal conductor (ref. no. 508, as seen in fig. 15(b)) whose main component is copper, formed in said opening.

Regarding claim 4, Kanegae teaches the semiconductor device according to claim 3, Kanegae teaches wherein said metal conductor is in direct contact with said modified portion (as seen in fig. 15(b)).

Claim Rejections - 35 USC § 103

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2 – 4 and 19 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanegae.

Regarding claim 2, as the Examiner pointed out in the Response to Arguments section aforementioned, it is inherent, if not obvious to one of ordinary skill in the art to recognize that some fluorine concentration would be present in the hybrid film in absent of representation in fig. 7 of Kanegae. Claims 3 – 4 and 19 – 20 depend from rejected claim 2. Rejections of the dependent claims would be the same as presented in this Office Action, but the claims rejections' dependencies would change in view of this obviousness rejection. It will not be written out for conciseness.

Claims 19 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanegae as applied to claim 4 above, and further in view of Shinichi (Japan Patent App. Pub. No. 2000-114367).

Regarding claim 19, Kanegae teaches the semiconductor device according to claim 4, but Kanegae does not teaches wherein the metal conductor comprises a barrier film whose main component is tantalum. However, drawing 5 of Shinichi teaches that it is known in the art to provide wherein the metal conductor (ref. no. 53) comprises a barrier film (ref. no. 52) whose main component is tantalum (par. 0002). Also see par.

0037. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the device of Kanegae with the barrier film of Kanegae, in order to prevent copper diffusing into the insulation layer (par. 0004). It is proper to combine Kanegae and Shinichi because they both teach about copper wiring in a semiconductor device.

Regarding claim 20, Kanegae and Shinichi teaches the semiconductor device according to claim 19, wherein the barrier film is in direct contact with the modified porition (as seen in combination with Kanegae's device as seen in fig. 3 and drawing 5 of Shinichi, wherein the insulating layer ref. no. 51 of Shinichi is equivalent to ref. no. 104 of Kanegae). Also to consider par. 0037 of Shinichi, since the barrier film ref. no. 15 consists Cu and Ta are formed in the opening, it is considered touching the modified portions.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

This action is a **final rejection** and is intended to close the prosecution of this application. Applicant's reply under 37 CFR 1.113 to this action is limited either to an appeal to the Board of Patent Appeals and Interferences or to an amendment complying with the requirements set forth below.

If applicant should desire to appeal any rejection made by the examiner, a Notice of Appeal must be filed within the period for reply identifying the rejected claim or claims appealed. The Notice of Appeal must be accompanied by the required appeal fee.

If applicant should desire to file an amendment, entry of a proposed amendment after final rejection cannot be made as a matter of right unless it merely cancels claims or complies with a formal requirement made earlier. Amendments touching the merits of the application which otherwise might not be proper may be admitted upon a showing a good and sufficient reasons why they are necessary and why they were not presented earlier.

A reply under 37 CFR 1.113 to a final rejection must include the appeal from, or cancellation of, each rejected claim. The filing of an amendment after final rejection, whether or not it is entered, does not stop the running of the statutory period for reply to the final rejection unless the examiner holds the claims to be in condition for allowance.

Accordingly, if a Notice of Appeal has not been filed properly within the period for reply, or any extension of this period obtained under either 37 CFR 1.136(a) or (b), the application will become abandoned.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoang-Quan Ho whose telephone number is (571) 272-8711. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HQH/
Hoang-Quan Ho
Junior Examiner
January 2, 2007

Andy Hung
Primary Examiner